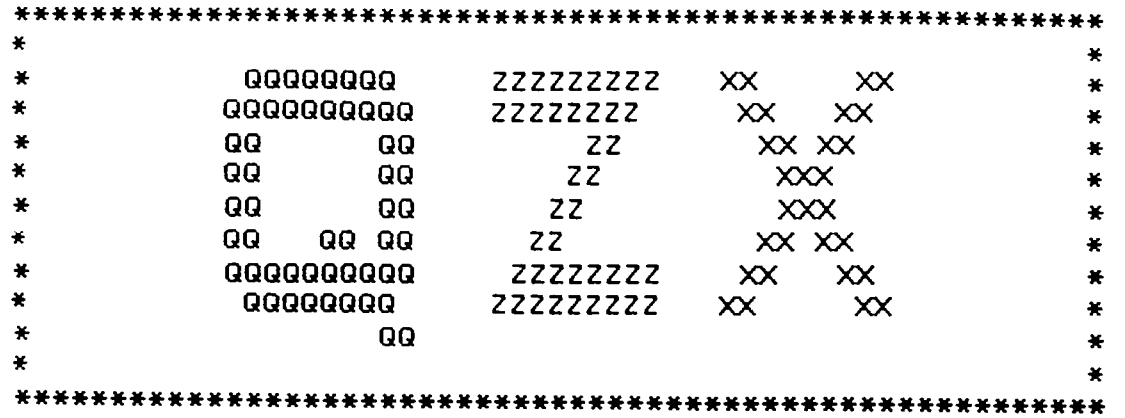

The Journal Covering Amateur Radio & Sinclair Computers
ZX80; Micro-Ace; ZX81; TS1000, 1500, & 2068; QL; Z88
Alex. F. Burr, K5XY, Publisher
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88001

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EDITOR'S NOTES

K5XY

Well, the printer did it again. I got yet another price for doing the May issue. (That sentance sure looks familiar.) Furthermore they mispaged it, but they ran it again at no charge. I am not really complaining because their cost is significantly less than any alternative.

This month starts an active summer for me. I am scheduled to leave for Guatamala a few days after this issue is mailed. There I am to teach a short course in power supplies. I will take a computer with me and make use of a remarkable program called Micro-Cap II. It allows you to draw a circuit diagram on the screen and then to show an oscilloscope like picture of up to four waveforms on another screen. I will use it to show the effect of filters on the dc output and to emphasize the effect of transformer and rectifier characteristics on the regulation curve of a power supply.

Unfortunately the only one of our computers on which the program will run is the QL with MSDOS adapter. Because I do not have one, I am not sure that it will run even then. The program says that it will, but I have had many disappointing experiences with computer hardware and software. This program is no exception. It is great for teaching electronics, but it will not run on the MSDOS (IBM) computers which my laboratory has. The company which wrote the program says that they are sorry, it runs on the model (different) that they have, but they are working on a new improved version and do not have the time to debug this version.

By the way, I have had a number of problems with these IBM computers. I am beginning to think that they are not compatible. If any reader has a MSDOS QL computer, write me and I will try to arrange for you to test this program.

Disaster almost struck last weekend. The savings and loan organization, in which all the QZX funds are kept, closed. Fortunately the account was insured. I expect all the funds to be recovered this week. In the meantime my funds will keep QZX going. Remember this when somebody complains about the cost of bailing them out.

UNCLASSIFIED ADS

WANTED: UNCLASSIFIED ADS for publication in QZX. Cost is 1 cent for each keystroke (characters, etc.). Payment must be included with order. This is an excellent way to sell your program or unwanted equipment, ask for help, or find a specific program. Send your ad with payment to QZX, 2025 O'Donnell, Las Cruces, NM 88001.

WANTED: Schematic wiring diagram for "Banana Gorrilla" printer. Edward L. Radtke, 1602 Woodluck Ave., Louisville, Kentucky 40205, 502-458-7324.

QZX Discount: 15% discount on all orders mentioning QZX. T & C Services (address in ad in this issue).

FOR SALE: TS1000's, 2068, programs, interfaces, etc. SASE Leslie Varnicle Box 821 Trinidad, CO 81082-0821.

QZX FRIENDS

WA2QKF -- Ron said he would like to see more programs for the TS2068 and ZX81 in QZX. If anybody would send in some they have developed, I would be more than happy to print them. They do not have to be complicated. An explaination of even some of the simple features would be appreciated by many of our readers.

WA3QLW -- Leslie has moved to Colorado and would like to sell some of her underused computers. See the unclassifieds.

EXPLORING THE TS1000 SINCLAIR LOGIC CHIP (SCL) VIII

Don Lamen

This article is a continuation of the series which began in the October 1989 issue of QZX. The purpose is to explain the function of the SCL logic chip in the ZX and TS1000 series of Sinclair computers. This chip is a custom chip designed particularly for our computers. The previous articles gave some background on the chip, provided a functional diagram, and listed 17 separate functions performed by the chip. These and succeeding articles discuss these functions individually and provide an equivalent circuit diagram for the function. These circuit diagrams are only the equivalent of the actual circuits inside the chip because nothing is known about the real connections inside, but the circuits given here will perform the function of the real circuit. For a list of these 17 functions see the October issue of QZX.

Last month we looked at one of the more complicated circuits in the SCL. This month we will look some smaller circuits; the video circuit, the tape circuits, and the RAM ROM select circuit.

Video Combiner and Inverter Circuit

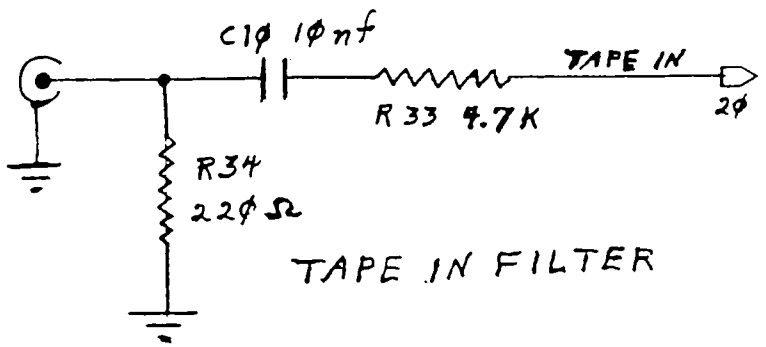
The video combiner and inverter circuit has 5 inputs and 1 output. This circuit is located in the middle of the right hand side of the general block diagram of the SCL shown in the October (1989) issue of QZX. These inputs are listed below.

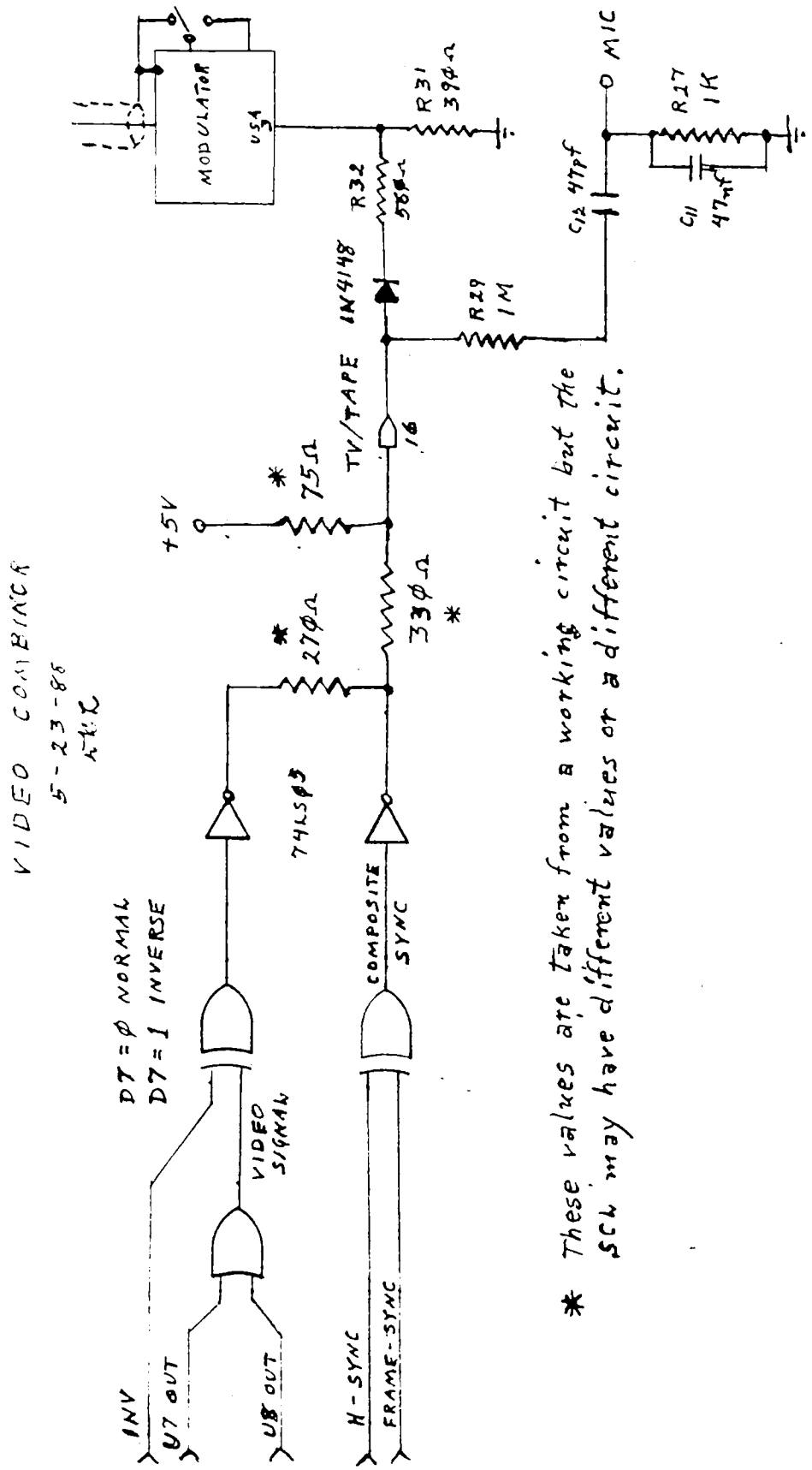
a) Horizontal sync pulse
b) Vertical (frame) sync pulse
c) Output from shift register 1
d) Output from shift register 2
e) the NORMAL/INVERSE signal

The output is the composite video signal at pin 16, which supplies both the video signal for the TV and the signal to a tape recorder input.

The inputs a) and b) are XORed together and inverted to form the composite sync signal. The inputs c) and d) are ORed together and passed to one input of a 2-input XOR gate. The input e) goes to the other input of the XOR gate. The output signal of this XOR gate is also inverted to form the video portion of the composite video signal. The video and sync signals are next summed together producing the composite video signal, which goes to pin 16. A circuit diagram of a possible realization of these functions is given on the next page.

Those parts of the circuit shown on the next page which are to the right of the pin 16 symbol actually appear on the circuit board of the computer. The lower right part of the diagram shows the attenuator and filter for the output which goes to the tape recorder input. For completeness, the actual circuit on the board used to filter the signal from the tape recorder for input to the SCL is shown at the bottom of this page.





* These values are taken from a working circuit but the SCI may have different values or a different circuit.

ROM/RAM Select circuit

The ROM/RAM select circuit is a simple circuit which operates as shown below. It is located in the upper right hand corner of the general SCL diagram shown in the October QZX.

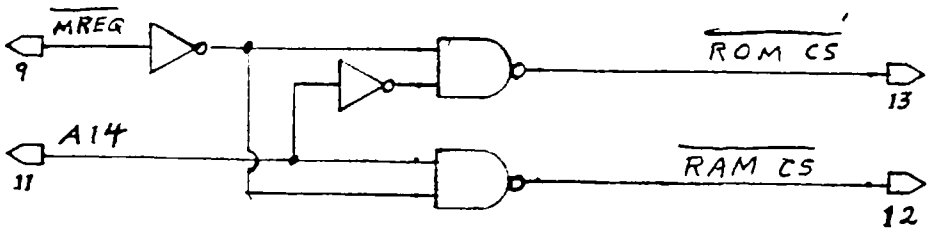
a) When NOT MREQ (pin9) is low and A14 (pin 11) is also low NOT ROM CS is high. This action enables the ROM and disables the RAM.

b) When NOT MREQ is low and A14 is high, NOT ROM CS is high and NOT RAM CS is low. This enables the RAM and disables the ROM.

c) When NOT MREQ is high both the ROM and the RAM are disabled.

A possible realization of this circuit is shown below.

This is the last circuit to be discussed. Next month this series of articles will conclude with some parameters related to the SCL and some notes on the timing of the various signals.



ROM / RAM SELECT CIRCUIT

16K RAM INSIDE THE ZX81

John Bell

This article is adapted from one written by John Bell which appeared in the November 1987 issue of L.I.S.T. It applies most directly to readers who have the ZX81, TS1000, or the PC8300. The last mentioned computer is a somewhat modified copy of the Sinclair computers and has a very similar internal layout.

Almost all users of ZX81 type computers have some sort of RAM Pack attached to the back of their machine. The major disadvantage of these devices is the "Ram Pack Wobble" which crashes the machine when imperfect electrical connections are made between the external pack and the computer. Even after curing this problem with clamps, screws, new cases, or washers as detailed in past issues of QZX, the arrangement strains the computer's power supply and occupies the only edge connector available for expansion. Modifying your computer with this internal RAM upgrade solves all of these problems and makes an interesting one night project for the builder.

There are only five parts required for this project. Two 8K RAM chips, one address decoder chip, one IC socket, and a resistor. See the parts list at the end for the chip numbers and possible sources. The tools required are a 15 to 25 watt soldering iron, wire cutters, a small flat blade screwdriver, and a solder sucker or length of de-soldering braid. (Tinned RG-8U shielding makes good de-soldering braid.) A small piece of rosin core solder and about two feet of small hookup wire will also be required to make the necessary connections. The first step is to remove the computer from its case. Since the reader can be working on one of several

different cases, this procedure will not be described. Readers working on a PC8300 will note that the keyboard cannot be disconnected from the circuit board as it can with the other computers. Be sure in this case not to flex the connecting cable too often. It can snap off the circuit board quite easily.

The RAM chip(s) on the computer circuit board must be removed so the two new RAM chips can be mounted. If you are working on a ZX81 or TS1000, the computer will have one or two RAM chips already in place. If there are five chips on your TS computer, the two 18 pin chips should be removed. If there are only four chips on the board, the 24 pin chip farthest away from the cassette connectors should be removed. PC8300 owners will have to remove the four 18 pin chips if there are eight chips on the computer board, or the 24 pin chip closest to the power connector if there are only five chips on the board.

It is a simple but time consuming process to remove the RAM chips. The procedure is as follows. Remove all the socketed IC chips from the circuit board to prevent static damage when you are working on the PC board. Draw a diagram showing the location of the chips so they can be replaced when the soldering is completed. Turn the board component side down and, using the soldering iron and solder sucker or braid, melt and remove the solder from each of the holes that the RAM chip pins go through. Once all of the solder is removed, straighten out any bent pins, and gently pry out the chips from the component side of the board using a key or small screwdriver. After the original RAM chips have been removed, a socket for the new RAM chips must be installed. A Timex/Sinclair board has the holes for a 28 pin socket and a PC8300 board has holes for a 24 pin socket. If these holes are filled with solder, clear them using a soldering iron and the solder sucker or wick.. Insert the appropriate IC socket in the corresponding holes on the circuit board and solder all the pins from the back using rosin core solder.

The new RAM chips (6264LP-150) can now be installed. Bend pin numbers 2, 20, 22, 23, and 26 (also 27, and 28 for a PC8300) of the first RAM chip up about 45 degrees. Bend pin numbers 20 and 22 of the second RAM chop out about 90 degrees. Press fit the second 6264 on top of the first so all of the pins except 20 and 22 are touching. Solder the 26 remaining pins together using only a small amount of solder where each pair of pins touch. Do not heat any of the pins for more than 5 or 10 seconds. Any longer and you risk destroying the chip. Once the chip stack is complete, install it in the socket on the TS board with the notch on the end of the chips facing the edge connector. PC8300 owners will have to install the chips so the notches face away from the power connector and with pins 1,2,27, and 28 overhanging the 24 pin socket.

The pins that were bent out sideways will have to be connected using short lengths of wire. See the diagram at the end of the article for the proper connections. The easiest place to find the proper signals on the board is at the computer's rear edge connector. When soldering near the fingers, be careful not to get solder on them. The 74LS138 has no socket to be mounted in. It should be mounted upside down on a bare spot on the PC board with some tape or glue. The wiring to the chip will have to be done using lengths of wire as short as possible to keep everything neat. The resistor can be mounted directly across pins 5 and 8 on the 74LS138. Be careful to make the proper connections since the chip is mounted upside down.

The construction work on the project is now complete. Check the wiring for errors, short circuits, and solder splashes. Re-install the chips that were removed in their sockets and check all the wiring and chip placements

again. Reassemble the computer, connect it to a TV, and turn the computer on. If nothing happens, or there is an unusual display, turn the computer off and check again for wiring errors and short circuits.

If everything works, enjoy the additional inboard RAM.

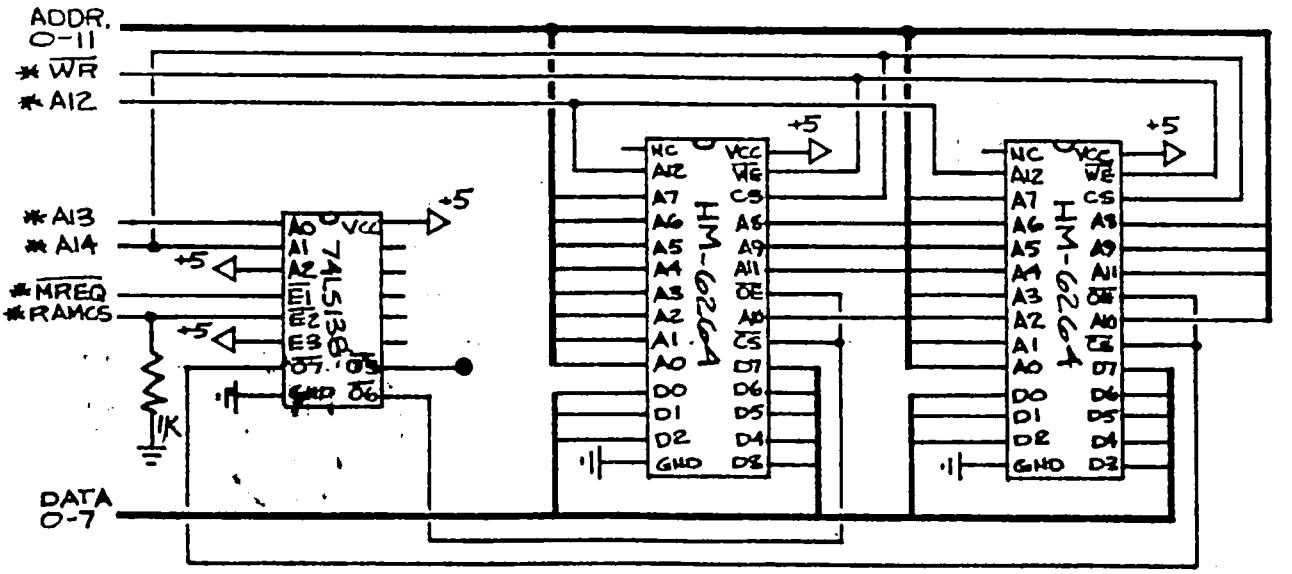
Parts List

(1) 74LS138 IC
(2) HM 6264LP-150 IC
(1) Solder tail IC socket 28 pin
or 24 pin see text
(1) 6.8K 1/4 watt resistor

Suppliers

JDR Microdevices, 110 Knowles Drive, Los Gatos, CA 95030. (800)538-5000. Visa, Master card

Jameco Electronics, 1355 Shoreway Road, Belmont, CA 94002.
(415)592-8097. Visa, Master card.



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